

Exhibit F

Cellular Communication Technologies LLC v. Apple Inc., et al.**EXHIBIT E TO PLAINTIFF'S SECOND SUPPLEMENTAL INFRINGEMENT CONTENTIONS**

U.S. Pat. No. 8,055,820	'820 APPLE ACCUSED PRODUCTS ¹
1. A method, comprising:	<p>Apple, AT&T, Verizon, Sprint, and T-Mobile infringe the '820 patent either directly and/or indirectly. Each Defendant makes, uses, sells, offers to sell, and/or imports '820 Apple Accused Products², each of which is a cellular device that includes and performs the features and capabilities described in this claim.</p> <p>Plaintiff contends that each Defendant directly infringes this claim because it makes, uses, sells, offers to sell, and/or imports the '820 Apple Accused Products, each of which includes and/or practices each and every element of this claim. Additionally, each Defendant indirectly infringes this claim by (1) inducing, with knowledge of the patent (at least by virtue of its disclosure to ETSI), its customers' use of the '820 Apple Accused Products to practice each and every one of the following claim elements with knowledge that such practice infringes this claim and intent to cause such infringement (as evidenced for example in user guides and other instructional materials provided by each Defendant such as instructions to operate the Accused Product within a provided service area), and/or (2) contributing to direct infringement by customers that use the '820 Apple Accused Products to practice each and every one of the following claim elements, with knowledge that infringing features of the '820 Apple Accused Products have no substantial non-infringing uses (by their nature as proprietary hardware components and software instructions that work in concert to perform specific, intended functions) and the combination for which such features was made infringes this claim.</p> <p>Each '820 Apple Accused Product is a subscriber station that performs a method</p>

¹ Discovery in this case is ongoing. Accordingly, Plaintiff expects that these contentions may be subject to supplementation and/or amendment after further discovery and disclosure of Defendant's non-infringement positions in order to focus the issues in this case. For example, Plaintiff may supplement these contentions in response to information learned during discovery to rebut allegations of non-infringement under the doctrine of equivalents. Additionally, Plaintiff expects that these contentions may be subject to amendment or supplementation to identify and accuse additional devices released, developed, or made available after the date on which these contentions are served.

² The '820 Apple Accused Products include the following products: iPhone 5, iPhone 5c, iPhone 5s, iPad (third generation a/k/a "the new iPad" or "iPad 3"), iPad (fourth generation a/k/a "the iPad with Retina display" or iPad 4"), iPad Mini, iPad Mini with Retina display, and iPad Air. Evidence supporting the use of relevant technology contained within this chart is listed in Appendix E-1.

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	<p>as set forth in this claim. Specifically, each '820 Apple Accused Product is a cellular device that includes hardware and software (including memory, one or more processors, radios, firmware, and drivers) configured to support and provide wireless communications in an LTE (E-UTRA) environment. As such, each '820 Apple Accused Product is compliant with and supports technical specifications published by 3GPP and ETSI for LTE (E-UTRA) technology, including TS 36.321, Release 8 and subsequent versions.³ Indeed, the '820 patent is essential to compliance with LTE (E-UTRA) standards.⁴</p> <p>In the LTE (E-UTRA) network environment, a subscriber station (or user equipment, "UE"), such as each '820 Apple Accused Product), is configured to perform a buffer status reporting procedure as set forth in TS 36.321. Buffer Status Reports (BSRs) from UE to network nodes are used to assist network allocation of uplink radio resources. In an LTE (E-UTRA) network environment, radio resources are only allocated for transmission to or from a UE if data is available to be sent or received. In the downlink direction, the network node scheduler is aware of the amount of data to be delivered to a UE. In the uplink direction, however, scheduling decisions are performed by a network node (e.g., an eNodeB) and the buffer for the data is located in the UE. Accordingly, BSRs must be sent by the UE to the network node to indicate the amount of data in the UE that needs to be transmitted over the uplink. <i>See</i> Stefania Sesia, et al., "LTE: The UMTS Long Term Evolution: From Theory to Practice," John Wiley & Sons, 2009.</p> <p>Accordingly, each '820 Apple Accused Product performs a BSR reporting procedure, set forth in TS 36.321, to provide serving network nodes with information about the amount of data available for transmission in its uplink buffers. More specifically, a BSR is triggered in each '820 Apple Accused Product if any of certain pre-selected conditions corresponding to the buffers occur, as set forth in TS 36.321. Depending on the condition detected, each '820</p>

³ See TS 36.321 Technical Specification, http://www.etsi.org/deliver/etsi_ts/136300_136399/136321/08.12.00_60/ts_136321v081200p.pdf.

⁴ http://ipr.etsi.org/IPRDetails.aspx?IPRD_ID=691&IPRD_TYPE_ID=2&MODE=2 (last accessed Mar. 20, 2014)

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	<p>Apple Accused Product designates a BSR reporting format (e.g., long BSR, truncated BSR, short BSR):</p> <p>5.4.5 Buffer Status Reporting</p> <p>The Buffer Status reporting procedure is used to provide the serving eNB with information about the amount of data available for transmission in the UL buffers of the UE. RRC controls BSR reporting by configuring the two timers <i>periodicBSR-Timer</i> and <i>retxBSR-Timer</i> and by, for each logical channel, optionally signalling <i>logicalChannelGroup</i> which allocates the logical channel to an LCG [8].</p> <p>For the Buffer Status reporting procedure, the UE shall consider all radio bearers which are not suspended and may consider radio bearers which are suspended.</p> <p>A Buffer Status Report (BSR) shall be triggered if any of the following events occur:</p> <ul style="list-style-type: none"> - UL data, for a logical channel which belongs to a LCG, becomes available for transmission in the RLC entity or in the PDCP entity (the definition of what data shall be considered as available for transmission is specified in [3] and [4] respectively) and either the data belongs to a logical channel with higher priority than the priorities of

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	<p>the logical channels which belong to any LCG and for which data is already available for transmission, or there is no data available for transmission for any of the logical channels which belong to a LCG, in which case the BSR is referred below to as "Regular BSR";</p> <ul style="list-style-type: none"> - UL resources are allocated and number of padding bits is equal to or larger than the size of the Buffer Status Report MAC control element plus its subheader, in which case the BSR is referred below to as "Padding BSR"; - <i>retxBSR-Timer</i> expires and the UE has data available for transmission for any of the logical channels which belong to a LCG, in which case the BSR is referred below to as "Regular BSR"; - <i>periodicBSR-Timer</i> expires, in which case the BSR is referred below to as "Periodic BSR". <p>For Regular and Periodic BSR:</p> <ul style="list-style-type: none"> - if more than one LCG has data available for transmission in the TTI where the BSR is transmitted: report Long BSR; - else report Short BSR. <p>For Padding BSR:</p> <ul style="list-style-type: none"> - if the number of padding bits is equal to or larger than the size of the Short BSR plus its subheader but smaller than the size of the Long BSR plus its subheader: <ul style="list-style-type: none"> - if more than one LCG has data available for transmission in the TTI where the BSR is transmitted: report Truncated BSR of the LCG with the highest priority logical channel with data available for transmission; - else report Short BSR. - else if the number of padding bits is equal to or larger than the size of the Long BSR plus its subheader, report Long BSR. <p>Long BSRs, Short BSRs, and Truncated BSRs are formatted as set forth in TS 36.321:</p>

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	<p>The fields LCG ID and Buffer Size are defined as follow:</p> <ul style="list-style-type: none"> - LCG ID: The Logical Channel Group ID field identifies the group of logical channel(s) which buffer status is being reported. The length of the field is 2 bits; - Buffer Size: The Buffer Size field identifies the total amount of data available across all logical channels of a logical channel group after the MAC PDU has been built. The amount of data is indicated in number of bytes. It shall include all data that is available for transmission in the RLC layer and in the PDCP layer; the definition of what data shall be considered as available for transmission is specified in [3] and [4] respectively. The size of the RLC and MAC headers are not considered in the buffer size computation. The length of this field is 6 bits. The values taken by the Buffer Size field are shown in Table 6.1.3.1-1. <div data-bbox="1087 553 1451 623" data-label="Diagram"> <pre> +-----+ LCG ID Buffer Size +-----+ Oct 1 </pre> </div> <p>Figure 6.1.3.1-1: Short BSR and Truncated BSR MAC control element</p> <div data-bbox="1087 703 1451 849" data-label="Diagram"> <pre> +-----+ Buffer Size #0 Buffer Size #1 +-----+ Buffer Size #1 Buffer Size #2 +-----+ Buffer Size #2 Buffer Size #3 +-----+ Oct 3 </pre> </div> <p>Figure 6.1.3.1-2: Long BSR MAC control element</p> <p>As shown above, the Short BSR and Truncated BSR format comprises 1 byte of information with a 2-bit LCG identifier and a 6-bit buffer size, while the Long BSR format comprises 3 bytes of information with four segments, 6 bits long, each corresponding to a particular LCG. Accordingly, the Long BSR reports the amount of data for four logical channel groups (LCGs), while the Short BSR and Truncated BSR reports the amount of data for one LCG. In the LTE (E-UTRA) network environment, each radio bearer (or logical channel) is mapped to a LCG by a network node (e.g., eNodeB) based on the quality of service attributes of the radio bearers (e.g., QoS Class Identifier). Accordingly, the Short BSR and Truncated BSR format corresponds to the buffer status of a single radio bearer group and the Long BSR format corresponds to the buffer status of multiple radio bearer groups.</p> <p>As shown above, TS 36.321 sets forth conditions under which a “Regular BSR”</p>

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	<p>or "Periodic BSR" is triggered. For "Regular BSRs" and "Periodic BSRs," if more than one LCG has data available for transmission and bandwidth is available, the Long BSR format is used. Accordingly, each '820 Apple Accused Product designates the Long BSR format when multiple buffers for different radio bearer groups store data beyond a preselected threshold (e.g., when uplink data becomes available for transmission in different bearer groups and/or buffers).</p> <p>As further shown above, in the case of "Padding BSR," each '820 Apple Accused Product reports a Long BSR when (1) uplink resources are allocated for buffered data (i.e., the buffers contain data waiting to be transferred from the UE to the network), (2) the number of padding bits is equal to or larger than the size of the BSR MAC control element plus its sub-header, and (3) the number of padding bits is equal to or larger than the size of a Long BSR plus its sub-header. Thus, when there is sufficient uplink bandwidth available for a Long BSR, each '820 Apple Accused Product designates and communicates using the Long BSR format.</p> <p>Continuing with the case of "Padding BSR," each '820 Apple Accused Product reports a Short or Truncated BSR when the number of padding bits is smaller than the size of a Long BSR but equal to or larger than a Short BSR. In such circumstances, if more than once LCG has data for transmission, each '820 Apple Accused Product will report a Truncated BSR of the LCG with the highest priority logical channel with data available for transmission. If only one LGC has data for transmission, each '820 Apple Accused Product will report a Short BSR.</p>
monitoring a usage of a plurality of buffers;	Each '820 Apple Accused Product monitors a usage of a plurality of buffers. As explained above, each '820 Apple Accused Product provides BSRs based on the buffer status of one or more LCGs.
detecting one of a plurality of pre-selected conditions corresponding to the plurality	Each '820 Apple Accused Product detects one of a plurality of pre-selected conditions corresponding to the plurality of buffers. As explained above, the

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of buffers;	<p>pre-selected conditions corresponding to buffers (e.g., presence of data in one or multiple buffers) that may be detected by each '820 Apple Accused Product are set forth in TS 36.321:</p> <p>5.4.5 Buffer Status Reporting</p> <p>The Buffer Status reporting procedure is used to provide the serving eNB with information about the amount of data available for transmission in the UL buffers of the UE. RRC controls BSR reporting by configuring the two timers <i>periodicBSR-Timer</i> and <i>retxBSR-Timer</i> and by, for each logical channel, optionally signalling <i>logicalChannelGroup</i> which allocates the logical channel to an LCG [8].</p> <p>For the Buffer Status reporting procedure, the UE shall consider all radio bearers which are not suspended and may consider radio bearers which are suspended.</p> <p>A Buffer Status Report (BSR) shall be triggered if any of the following events occur:</p> <ul style="list-style-type: none"> UL data, for a logical channel which belongs to a LCG, becomes available for transmission in the RLC entity or in the PDCP entity (the definition of what data shall be considered as available for transmission is specified in [3] and [4] respectively) and either the data belongs to a logical channel with higher priority than the priorities of

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	<p>the logical channels which belong to any LCG and for which data is already available for transmission, or there is no data available for transmission for any of the logical channels which belong to a LCG, in which case the BSR is referred below to as "Regular BSR";</p> <ul style="list-style-type: none"> - UL resources are allocated and number of padding bits is equal to or larger than the size of the Buffer Status Report MAC control element plus its subheader, in which case the BSR is referred below to as "Padding BSR"; - <i>retxBSR-Timer</i> expires and the UE has data available for transmission for any of the logical channels which belong to a LCG, in which case the BSR is referred below to as "Regular BSR"; - <i>periodicBSR-Timer</i> expires, in which case the BSR is referred below to as "Periodic BSR". <p>For Regular and Periodic BSR:</p> <ul style="list-style-type: none"> - if more than one LCG has data available for transmission in the TTI where the BSR is transmitted: report Long BSR; - else report Short BSR. <p>For Padding BSR:</p> <ul style="list-style-type: none"> - if the number of padding bits is equal to or larger than the size of the Short BSR plus its subheader but smaller than the size of the Long BSR plus its subheader: <ul style="list-style-type: none"> - if more than one LCG has data available for transmission in the TTI where the BSR is transmitted: report Truncated BSR of the LCG with the highest priority logical channel with data available for transmission; - else report Short BSR. - else if the number of padding bits is equal to or larger than the size of the Long BSR plus its subheader, report Long BSR.
designating one of a plurality of buffer status reporting formats comprising a long buffer status reporting format and a short buffer status reporting format depending on the pre-selected condition detected; and	<p>Each '820 Apple Accused Product designates one of a plurality of buffer status reporting formats comprising a long buffer status reporting format and a short buffer status reporting format depending on the pre-selected condition detected.</p> <p>As explained above, each '820 Apple Accused Product designates a Long BSR, Truncated BSR, or Short BSR depending on detected conditions.</p> <p>In the case of "Regular BSRs" and "Periodic BSRs," if more than one LCG has data available for transmission and bandwidth is available, the Long BSR format is used. Accordingly, each '820 Apple Accused Product designates the Long BSR format when multiple buffers for different radio bearer groups store data beyond a preselected threshold (e.g., when uplink data becomes available for</p>

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	<p>transmission in different bearer groups and/or buffers).</p> <p>In the case of "Padding BSR," each '820 Apple Accused Product reports a Long BSR when (1) uplink resources are allocated for buffered data (i.e., the buffers contain data waiting to be transferred from the UE to the network), (2) the number of padding bits is equal to or larger than the size of the BSR MAC control element plus its sub-header, and (3) the number of padding bits is equal to or larger than the size of a Long BSR plus its sub-header. Each '820 Apple Accused Product reports a Short or Truncated BSR when the number of padding bits is smaller than the size of a Long BSR but equal to or larger than a Short BSR.</p>
communicating a buffer status report to a network device in accordance with the buffer status reporting format designated,	<p>Each '820 Apple Accused Product communicates a buffer status report to a network device in accordance with the buffer status reporting format designated. As explained above, each '820 Apple Accused Product transmits a BSR (e.g., a Long BSR, Truncated BSR, or Short BSR) to a LTE (E-UTRA) network node (e.g., an eNodeB).</p>
wherein the designating designates the long buffer status reporting format when there is sufficient uplink bandwidth to communicate using the long buffer status reporting format.	<p>Each '820 Apple Accused Product designates the long buffer status reporting format when there is sufficient uplink bandwidth to communicate using the long buffer status reporting format.</p> <p>For instance, as explained above for "Regular BSRs" and "Periodic BSRs," if more than one LCG has data available for transmission and bandwidth is available, the Long BSR format is used. Further, as explained above in the case of "Padding BSR," each '820 Apple Accused Product reports a Long BSR when (1) uplink resources are allocated for buffered data (i.e., the buffers contain data waiting to be transferred from the UE to the network), (2) the number of padding bits is equal to or larger than the size of the BSR MAC control element plus its sub-header, and (3) the number of padding bits is equal to or larger than the size of a Long BSR plus its sub-header. Additionally, as explained above for "Regular BSRs" and "Periodic BSRs," if more than one LCG has data available for transmission and bandwidth is available, the Long BSR format is used. In</p>

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	<p>such instances, the Long BSR has priority over other data, including user data.</p> <p>Thus, when there is sufficient uplink bandwidth available for a Long BSR (e.g., when there is enough space in the uplink resources allocated for buffered data), each '820 Apple Accused Product designates and communicates using the Long BSR format.</p> <p>Alternatively, CCE contends that this claim element is met under the doctrine of equivalents because above-described features of the Accused Products perform substantially the same function recited in this element, in substantially the same way to achieve substantially the same result. Any alleged differences between the above-described features and the recited element are insubstantial and immaterial to infringement.</p>
<p>4. The method of claim 1, wherein the short buffer status reporting format corresponds to reporting a buffer status of a single radio bearer group and the long buffer status reporting format corresponds to reporting a buffer status of multiple radio bearer groups.</p>	<p><i>See</i> analysis of claim 1, which is incorporated herein by reference.</p> <p>As shown above, each '820 Apple Accused Product includes and performs the features and capabilities described in claim 1. Further, the short buffer status reporting format used by each '820 Apple Accused Product corresponds to reporting a buffer status of a single radio bearer group and the long buffer status reporting format corresponds to reporting a buffer status of multiple radio bearer groups.</p> <p>As explained above, Long BSRs, Short BSRs, and Truncated BSRs are formatted as set forth in TS 36.321:</p>

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	<p>The fields LCG ID and Buffer Size are defined as follow:</p> <ul style="list-style-type: none"> - LCG ID: The Logical Channel Group ID field identifies the group of logical channel(s) which buffer status is being reported. The length of the field is 2 bits; - Buffer Size: The Buffer Size field identifies the total amount of data available across all logical channels of a logical channel group after the MAC PDU has been built. The amount of data is indicated in number of bytes. It shall include all data that is available for transmission in the RLC layer and in the PDCP layer; the definition of what data shall be considered as available for transmission is specified in [3] and [4] respectively. The size of the RLC and MAC headers are not considered in the buffer size computation. The length of this field is 6 bits. The values taken by the Buffer Size field are shown in Table 6.1.3.1-1. <div data-bbox="1087 553 1451 625" data-label="Diagram"> <pre> graph LR subgraph Oct1 [Oct 1] LCG_ID[LCG ID] Buffer_Size[Buffer Size] end </pre> </div> <p>Figure 6.1.3.1-1: Short BSR and Truncated BSR MAC control element</p> <div data-bbox="1087 703 1451 849" data-label="Diagram"> <pre> graph LR subgraph Oct1 [Oct 1] BS0[Buffer Size #0] BS1[Buffer Size #1] end subgraph Oct2 [Oct 2] BS2[Buffer Size #2] BS3[Buffer Size #3] end </pre> </div> <p>Figure 6.1.3.1-2: Long BSR MAC control element</p> <p>The Short BSR and Truncated BSR format comprises 1 byte of information with a 2-bit LCG identifier and a 6-bit buffer size, while the Long BSR format comprises 3 bytes of information with four segments, 6 bits long, each corresponding to a particular LCG. Accordingly, the Long BSR reports the amount of data for four logical channel groups (LCGs), while the Short BSR and Truncated BSR reports the amount of data for one LCG. In the LTE (EUTRA) network environment, each radio bearer (or logical channel) is mapped to a LCG by a network node (e.g., eNodeB) based on the quality of service attributes of the radio bearers (e.g., QoS Class Identifier). Accordingly, the Short BSR and Truncated BSR format corresponds to the buffer status of a single radio bearer group and the Long BSR format corresponds to the buffer status of multiple radio bearer groups.</p>

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<p>6. The method of claim 1, wherein the designating designates the short buffer status reporting format when there is insufficient uplink bandwidth.</p>	<p><i>See</i> analysis of claim 1, which is incorporated herein by reference.</p> <p>As shown above, each '820 Apple Accused Product includes and performs the features and capabilities described in claim 1. Further, as discussed above with the case of "Padding BSR," the Short or Truncated buffer status reporting format is used when there is insufficient uplink bandwidth for a long BSR:</p> <p>5.4.5 Buffer Status Reporting</p> <p>The Buffer Status reporting procedure is used to provide the serving eNB with information about the amount of data available for transmission in the UL buffers of the UE. RRC controls BSR reporting by configuring the two timers <i>periodicBSR-Timer</i> and <i>retxBSR-Timer</i> and by, for each logical channel, optionally signalling <i>logicalChannelGroup</i> which allocates the logical channel to an LCG [8].</p> <p>For the Buffer Status reporting procedure, the UE shall consider all radio bearers which are not suspended and may consider radio bearers which are suspended.</p> <p>A Buffer Status Report (BSR) shall be triggered if any of the following events occur:</p> <ul style="list-style-type: none"> UL data, for a logical channel which belongs to a LCG, becomes available for transmission in the RLC entity or in the PDCP entity (the definition of what data shall be considered as available for transmission is specified in [3] and [4] respectively) and either the data belongs to a logical channel with higher priority than the priorities of

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	<p>the logical channels which belong to any LCG and for which data is already available for transmission, or there is no data available for transmission for any of the logical channels which belong to a LCG, in which case the BSR is referred below to as "Regular BSR";</p> <ul style="list-style-type: none"> - UL resources are allocated and number of padding bits is equal to or larger than the size of the Buffer Status Report MAC control element plus its subheader, in which case the BSR is referred below to as "Padding BSR"; - <i>retxBSR-Timer</i> expires and the UE has data available for transmission for any of the logical channels which belong to a LCG, in which case the BSR is referred below to as "Regular BSR"; - <i>periodicBSR-Timer</i> expires, in which case the BSR is referred below to as "Periodic BSR". <p>For Regular and Periodic BSR:</p> <ul style="list-style-type: none"> - if more than one LCG has data available for transmission in the TTI where the BSR is transmitted: report Long BSR; - else report Short BSR. <p>For Padding BSR:</p> <ul style="list-style-type: none"> - if the number of padding bits is equal to or larger than the size of the Short BSR plus its subheader but smaller than the size of the Long BSR plus its subheader: <ul style="list-style-type: none"> - if more than one LCG has data available for transmission in the TTI where the BSR is transmitted: report Truncated BSR of the LCG with the highest priority logical channel with data available for transmission; - else report Short BSR. - else if the number of padding bits is equal to or larger than the size of the Long BSR plus its subheader, report Long BSR. <p>For instance, as explained above in the case of "Padding BSR," each '820 HTC Accused Product reports a Short or Truncated BSR when the number of padding bits is smaller than the size of a Long BSR but equal to or larger than a Short BSR.</p> <p>Alternatively, CCE contends that this claim element is met under the doctrine of equivalents because above-described features of the Accused Products perform substantially the same function recited in this element, in substantially the same way to achieve substantially the same result. Any alleged differences between the above-described features and the recited element are insubstantial and immaterial to infringement.</p>

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<p>9. The method of claim 1, wherein the long buffer status reporting format comprises four segments of 6-bits of information, each segment thereof corresponding to a distinct radio bearer group.</p>	<p><i>See</i> analysis of claim 1, which is incorporated herein by reference.</p> <p>As shown above, each '820 Apple Accused Product includes and performs the features and capabilities described in claim 1. Further, the long buffer status reporting format of each '820 Apple Accused Product comprises four segments of 6-bits of information, each segment thereof corresponding to a distinct radio bearer group.</p> <p>As explained above, Long BSRs, Short BSRs, and Truncated BSRs of each '820 Apple Accused Product are formatted as set forth in TS 36.321:</p> <p>The fields LCG ID and Buffer Size are defined as follow:</p> <ul style="list-style-type: none"> - LCG ID: The Logical Channel Group ID field identifies the group of logical channel(s) which buffer status is being reported. The length of the field is 2 bits; - Buffer Size: The Buffer Size field identifies the total amount of data available across all logical channels of a logical channel group after the MAC PDU has been built. The amount of data is indicated in number of bytes. It shall include all data that is available for transmission in the RLC layer and in the PDCP layer; the definition of what data shall be considered as available for transmission is specified in [3] and [4] respectively. The size of the RLC and MAC headers are not considered in the buffer size computation. The length of this field is 6 bits. The values taken by the Buffer Size field are shown in Table 6.1.3.1-1. <div data-bbox="1087 911 1451 979" data-label="Diagram"> </div> <p>Figure 6.1.3.1-1: Short BSR and Truncated BSR MAC control element</p> <div data-bbox="1087 1060 1451 1206" data-label="Diagram"> </div> <p>Figure 6.1.3.1-2: Long BSR MAC control element</p> <p>The Short BSR and Truncated BSR format of each '820 Apple Accused Product comprises 1 byte (i.e., 8 bits) of information with a 2-bit LCG identifier and a 6-bit buffer size, while the Long BSR format of each '820 Apple Accused Product comprises 3 bytes (i.e., 24 bits) of information with four segments, 6 bits long,</p>

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	<p>each corresponding to a particular LCC. Accordingly, the Long BSR reports the amount of data for four logical channel groups (LCGs) of each '820 Apple Accused Product, while the Short BSR and Truncated BSR reports the amount of data for one LCG. In the LTE (E-UTRA) network environment of each '820 Apple Accused Product, each radio bearer (or logical channel) is mapped to a LCG by a network node (e.g., eNodeB) based on the quality of service attributes of the radio bearers (e.g., QoS Class Identifier). Accordingly, the Short BSR and Truncated BSR format of each '820 Apple Accused Product corresponds to the buffer status of a single radio bearer group and the Long BSR format of each '820 Apple Accused Product corresponds to the buffer status of multiple radio bearer groups.</p>
<p>10. The method of claim 1, further comprising: selecting a buffer status of a radio bearer group of a highest priority.</p>	<p><i>See</i> analysis of claim 1, which is incorporated herein by reference.</p> <p>As shown above, each '820 Apple Accused Product includes and performs the features and capabilities described in claim 1. Further, for each '820 Apple Accused Product, in the case of "Padding BSR", when more than one LCG has data available for transmission in the interval where the BSR is transmitted, a Truncated BSR for the LCG with the highest priority logical channel with data available for transmission is selected for reporting. If only one LGC has data for transmission, that LGC has the highest priority and each '820 Apple Accused Product will report a Short BSR.</p>

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	<p>5.4.5 Buffer Status Reporting</p> <p>The Buffer Status reporting procedure is used to provide the serving eNB with information about the amount of data available for transmission in the UL buffers of the UE. RRC controls BSR reporting by configuring the two timers <i>periodicBSR-Timer</i> and <i>retxBSR-Timer</i> and by, for each logical channel, optionally signalling <i>logicalChannelGroup</i> which allocates the logical channel to an LCG [8].</p> <p>For the Buffer Status reporting procedure, the UE shall consider all radio bearers which are not suspended and may consider radio bearers which are suspended.</p> <p>A Buffer Status Report (BSR) shall be triggered if any of the following events occur:</p> <ul style="list-style-type: none"> - UL data, for a logical channel which belongs to a LCG, becomes available for transmission in the RLC entity or in the PDCP entity (the definition of what data shall be considered as available for transmission is specified in [3] and [4] respectively) and either the data belongs to a logical channel with higher priority than the priorities of the logical channels which belong to any LCG and for which data is already available for transmission, or there is no data available for transmission for any of the logical channels which belong to a LCG, in which case the BSR is referred below to as "Regular BSR"; - UL resources are allocated and number of padding bits is equal to or larger than the size of the Buffer Status Report MAC control element plus its subheader, in which case the BSR is referred below to as "Padding BSR"; - <i>retxBSR-Timer</i> expires and the UE has data available for transmission for any of the logical channels which belong to a LCG, in which case the BSR is referred below to as "Regular BSR"; - <i>periodicBSR-Timer</i> expires, in which case the BSR is referred below to as "Periodic BSR". <p>For Regular and Periodic BSR:</p> <ul style="list-style-type: none"> - if more than one LCG has data available for transmission in the TTI where the BSR is transmitted: report Long BSR; - else report Short BSR. <p>For Padding BSR:</p> <ul style="list-style-type: none"> - if the number of padding bits is equal to or larger than the size of the Short BSR plus its subheader but smaller than the size of the Long BSR plus its subheader: <ul style="list-style-type: none"> - if more than one LCG has data available for transmission in the TTI where the BSR is transmitted: report Truncated BSR of the LCG with the highest priority logical channel with data available for transmission; - else report Short BSR. - else if the number of padding bits is equal to or larger than the size of the Long BSR plus its subheader, report Long BSR. <p>Alternatively, CCE contends that this claim element is met under the doctrine of</p>

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	equivalents because above-described features of the Accused Products perform substantially the same function recited in this element, in substantially the same way to achieve substantially the same result. Any alleged differences between the above-described features and the recited element are insubstantial and immaterial to infringement.
12. An apparatus, comprising:	<p>Apple, AT&T, Verizon, Sprint and T-Mobile infringe the '820 patent either directly and/or indirectly. Each Defendant makes, uses, sells, offers to sell, and/or imports the '820 Apple Accused Products⁵, each of which is a cellular device that includes the features and capabilities described in this claim.</p> <p>Plaintiff contends that each Defendant directly infringes this claim because it makes, uses, sells, offers to sell, and/or imports the '820 Apple Accused Products, each of which includes and/or practices each and every element of this claim.</p> <p>Each '820 Apple Accused Product is a subscriber station (apparatus) that contains each of the elements set forth in this claim. Specifically, each '820 Apple Accused Product is a cellular device that includes hardware and software (including memory, one or more processors, radios, firmware, and drivers) configured to support and provide wireless communications in an LTE (E-UTRA) environment. As such, each '820 Apple Accused Product is compliant with and supports technical specifications published by 3GPP and ETSI for LTE (E-UTRA) technology, including TS 36.321. Indeed, the '820 patent is essential to compliance with LTE (E-UTRA) standards.</p> <p>In the LTE (E-UTRA) network environment, a subscriber station (or user equipment, "UE"), such as each '820 Apple Accused Product, is configured to perform a buffer status reporting procedure as set forth in TS 36.321. Buffer Status Reports (BSRs) from UE to network nodes are used to assist network</p>

⁵ The '820 Apple Accused Products include the following products: iPhone 5, iPhone 5c, iPhone 5s, iPad (third generation a/k/a "the new iPad" or "iPad 3"), iPad (fourth generation a/k/a "the iPad with Retina display" or iPad 4"), iPad Mini, iPad Mini with Retina display, and iPad Air.

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	<p>allocation of uplink radio resources. In an LTE (E-UTRA) network environment, radio resources are only allocated for transmission to or from a UE if data is available to be sent or received. In the downlink direction, the network node scheduler is aware of the amount of data to be delivered to a UE. In the uplink direction, however, scheduling decisions are performed by a network node (e.g., an eNodeB) and the buffer for the data is located in the UE. Accordingly, BSRs must be sent by the UE to the network node to indicate the amount of data in the UE that needs to be transmitted over the uplink. <i>See</i> Stefania Sesia, et al., "LTE: The UMTS Long Term Evolution: From Theory to Practice," John Wiley & Sons, 2009.</p> <p>Accordingly, each '820 Apple Accused Product performs a BSR reporting procedure, set forth in TS 36.321, to provide serving network nodes with information about the amount of data available for transmission in its uplink buffers. More specifically, a BSR is triggered in each '820 Apple Accused Product if any of certain pre-selected conditions corresponding to the buffers occur, as set forth in TS 36.321. Depending on the condition detected, each '820 Apple Accused Product designates a BSR reporting format (e.g., long BSR, truncated BSR, short BSR):</p> <p>5.4.5 Buffer Status Reporting</p> <p>The Buffer Status reporting procedure is used to provide the serving eNB with information about the amount of data available for transmission in the UL buffers of the UE. RRC controls BSR reporting by configuring the two timers <i>periodicBSR-Timer</i> and <i>retxBSR-Timer</i> and by, for each logical channel, optionally signalling <i>logicalChannelGroup</i> which allocates the logical channel to an LCG [8].</p> <p>For the Buffer Status reporting procedure, the UE shall consider all radio bearers which are not suspended and may consider radio bearers which are suspended.</p> <p>A Buffer Status Report (BSR) shall be triggered if any of the following events occur:</p> <ul style="list-style-type: none"> - UL data, for a logical channel which belongs to a LCG, becomes available for transmission in the RLC entity or in the PDCP entity (the definition of what data shall be considered as available for transmission is specified in [3] and [4] respectively) and either the data belongs to a logical channel with higher priority than the priorities of

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	<p>the logical channels which belong to any LCG and for which data is already available for transmission, or there is no data available for transmission for any of the logical channels which belong to a LCG, in which case the BSR is referred below to as "Regular BSR";</p> <ul style="list-style-type: none"> - UL resources are allocated and number of padding bits is equal to or larger than the size of the Buffer Status Report MAC control element plus its subheader, in which case the BSR is referred below to as "Padding BSR"; - <i>retxBSR-Timer</i> expires and the UE has data available for transmission for any of the logical channels which belong to a LCG, in which case the BSR is referred below to as "Regular BSR"; - <i>periodicBSR-Timer</i> expires, in which case the BSR is referred below to as "Periodic BSR". <p>For Regular and Periodic BSR:</p> <ul style="list-style-type: none"> - if more than one LCG has data available for transmission in the TTI where the BSR is transmitted: report Long BSR; - else report Short BSR. <p>For Padding BSR:</p> <ul style="list-style-type: none"> - if the number of padding bits is equal to or larger than the size of the Short BSR plus its subheader but smaller than the size of the Long BSR plus its subheader: <ul style="list-style-type: none"> - if more than one LCG has data available for transmission in the TTI where the BSR is transmitted: report Truncated BSR of the LCG with the highest priority logical channel with data available for transmission; - else report Short BSR. - else if the number of padding bits is equal to or larger than the size of the Long BSR plus its subheader, report Long BSR. <p>Long BSRs, Short BSRs, and Truncated BSRs are formatted as set forth in TS 36.321:</p>

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	<p>The fields LCG ID and Buffer Size are defined as follow:</p> <ul style="list-style-type: none"> - LCG ID: The Logical Channel Group ID field identifies the group of logical channel(s) which buffer status is being reported. The length of the field is 2 bits; - Buffer Size: The Buffer Size field identifies the total amount of data available across all logical channels of a logical channel group after the MAC PDU has been built. The amount of data is indicated in number of bytes. It shall include all data that is available for transmission in the RLC layer and in the PDCP layer; the definition of what data shall be considered as available for transmission is specified in [3] and [4] respectively. The size of the RLC and MAC headers are not considered in the buffer size computation. The length of this field is 6 bits. The values taken by the Buffer Size field are shown in Table 6.1.3.1-1. <div data-bbox="1087 553 1451 626" data-label="Diagram"> <pre> graph LR subgraph Oct1 [Oct 1] LCG_ID[LCG ID] Buffer_Size[Buffer Size] end </pre> </div> <p>Figure 6.1.3.1-1: Short BSR and Truncated BSR MAC control element</p> <div data-bbox="1087 703 1451 850" data-label="Diagram"> <pre> graph LR subgraph Oct1 [Oct 1] BS0[Buffer Size #0] BS1[Buffer Size #1] end subgraph Oct2 [Oct 2] BS2[Buffer Size #2] BS3[Buffer Size #3] end subgraph Oct3 [Oct 3] BS4[Buffer Size #4] BS5[Buffer Size #5] end </pre> </div> <p>Figure 6.1.3.1-2: Long BSR MAC control element</p> <p>As shown above, the Short BSR and Truncated BSR format comprises 1 byte of information with a 2-bit LCG identifier and a 6-bit buffer size, while the Long BSR format comprises 3 bytes of information with four segments, 6 bits long, each corresponding to a particular LCG. Accordingly, the Long BSR reports the amount of data for four logical channel groups (LCGs), while the Short BSR and Truncated BSR reports the amount of data for one LCG. In the LTE (E-UTRA) network environment, each radio bearer (or logical channel) is mapped to a LCG by a network node (e.g., eNodeB) based on the quality of service attributes of the radio bearers (e.g., QoS Class Identifier). Accordingly, the Short BSR and Truncated BSR format corresponds to the buffer status of a single radio bearer group and the Long BSR format corresponds to the buffer status of multiple radio bearer groups.</p> <p>As shown above, TS 36.321 sets forth conditions under which a “Regular BSR”</p>

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	<p>or “Periodic BSR” is triggered. For “Regular BSRs” and “Periodic BSRs,” if more than one LCG has data available for transmission and bandwidth is available, the Long BSR format is used. Accordingly, each '820 Apple Accused Product designates the Long BSR format when multiple buffers for different radio bearer groups store data beyond a preselected threshold (e.g., when uplink data becomes available for transmission in different bearer groups and/or buffers).</p> <p>As further shown above, in the case of “Padding BSR,” each '820 Apple Accused Product reports a Long BSR when (1) uplink resources are allocated for buffered data (i.e., the buffers contain data waiting to be transferred from the UE to the network), (2) the number of padding bits is equal to or larger than the size of the BSR MAC control element plus its sub-header, and (3) the number of padding bits is equal to or larger than the size of a Long BSR plus its sub-header. Thus, when there is sufficient uplink bandwidth available for a Long BSR, each '820 Apple Accused Product designates and communicates using the Long BSR format.</p> <p>Continuing with the case of “Padding BSR,” each '820 Apple Accused Product reports a Short or Truncated BSR when the number of padding bits is smaller than the size of a Long BSR but equal to or larger than a Short BSR. In such circumstances, if more than once LCG has data for transmission, each '820 Apple Accused Product will report a Truncated BSR of the LCG with the highest priority logical channel with data available for transmission. If only one LGC has data for transmission, each '820 Apple Accused Product will report a Short BSR.</p>
a processor	Each '820 Apple Accused Product contains a processor (such as a baseband processor) that is utilized in communicating buffer status reports.
a memory including computer program code, the memory and the computer program code configured to, with the	Each '820 Apple Accused Product contains a memory which includes computer program code. The memory, in combination with its computer program code and the processor cause each '820 Apple Accused Product at least to perform the

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processor, cause the apparatus at least to	below steps:
monitor a usage of a plurality of buffers;	Each '820 Apple Accused Product monitors a usage of a plurality of buffers. As explained above, each '820 Apple Accused Product provides BSRs based on the buffer status of one or more LCGs.
detect one of a plurality of pre-selected conditions corresponding to the plurality of buffers;	<p>Each '820 Apple Accused Product detects one of a plurality of pre-selected conditions corresponding to the plurality of buffers. As explained above, the pre-selected conditions corresponding to buffers (e.g., presence of data in one or multiple buffers) that may be detected by each '820 Apple Accused Product are set forth in TS 36.321:</p> <p>5.4.5 Buffer Status Reporting</p> <p>The Buffer Status reporting procedure is used to provide the serving eNB with information about the amount of data available for transmission in the UL buffers of the UE. RRC controls BSR reporting by configuring the two timers <i>periodicBSR-Timer</i> and <i>retxBSR-Timer</i> and by, for each logical channel, optionally signalling <i>logicalChannelGroup</i> which allocates the logical channel to an LCG [8].</p> <p>For the Buffer Status reporting procedure, the UE shall consider all radio bearers which are not suspended and may consider radio bearers which are suspended.</p> <p>A Buffer Status Report (BSR) shall be triggered if any of the following events occur:</p> <ul style="list-style-type: none"> UL data, for a logical channel which belongs to a LCG, becomes available for transmission in the RLC entity or in the PDCP entity (the definition of what data shall be considered as available for transmission is specified in [3] and [4] respectively) and either the data belongs to a logical channel with higher priority than the priorities of

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	<p>the logical channels which belong to any LCG and for which data is already available for transmission, or there is no data available for transmission for any of the logical channels which belong to a LCG, in which case the BSR is referred below to as "Regular BSR";</p> <ul style="list-style-type: none"> - UL resources are allocated and number of padding bits is equal to or larger than the size of the Buffer Status Report MAC control element plus its subheader, in which case the BSR is referred below to as "Padding BSR"; - <i>retxBSR-Timer</i> expires and the UE has data available for transmission for any of the logical channels which belong to a LCG, in which case the BSR is referred below to as "Regular BSR"; - <i>periodicBSR-Timer</i> expires, in which case the BSR is referred below to as "Periodic BSR". <p>For Regular and Periodic BSR:</p> <ul style="list-style-type: none"> - if more than one LCG has data available for transmission in the TTI where the BSR is transmitted: report Long BSR; - else report Short BSR. <p>For Padding BSR:</p> <ul style="list-style-type: none"> - if the number of padding bits is equal to or larger than the size of the Short BSR plus its subheader but smaller than the size of the Long BSR plus its subheader: <ul style="list-style-type: none"> - if more than one LCG has data available for transmission in the TTI where the BSR is transmitted: report Truncated BSR of the LCG with the highest priority logical channel with data available for transmission; - else report Short BSR. - else if the number of padding bits is equal to or larger than the size of the Long BSR plus its subheader, report Long BSR.
designate one of a plurality of buffer status reporting formats comprising a long buffer status reporting format and a short buffer status reporting format depending on the pre-selected condition detected; and	<p>Each '820 Apple Accused Product designates one of a plurality of buffer status reporting formats comprising a long buffer status reporting format and a short buffer status reporting format depending on the pre-selected condition detected.</p> <p>As explained above, each '820 Apple Accused Product designates a Long BSR, Truncated BSR, or Short BSR depending on detected conditions.</p> <p>In the case of "Regular BSRs" and "Periodic BSRs," if more than one LCG has data available for transmission and bandwidth is available, the Long BSR format is used. Accordingly, each '820 Apple Accused Product designates the Long BSR format when multiple buffers for different radio bearer groups store data beyond a preselected threshold (e.g., when uplink data becomes available for</p>

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	<p>transmission in different bearer groups and/or buffers).</p> <p>In the case of "Padding BSR," each '820 Apple Accused Product reports a Long BSR when (1) uplink resources are allocated for buffered data (i.e., the buffers contain data waiting to be transferred from the UE to the network), (2) the number of padding bits is equal to or larger than the size of the BSR MAC control element plus its sub-header, and (3) the number of padding bits is equal to or larger than the size of a Long BSR plus its sub-header. Each '820 Apple Accused Product reports a Short or Truncated BSR when the number of padding bits is smaller than the size of a Long BSR but equal to or larger than a Short BSR.</p>
<p>communicate a buffer status report to a network device in accordance with the buffer status reporting format designated,</p>	<p>Each '820 Apple Accused Product communicates a buffer status report to a network device in accordance with the buffer status reporting format designated. As explained above, each '820 Apple Accused Product transmits a BSR (e.g., a Long BSR, Truncated BSR, or Short BSR) to a LTE (E-UTRA) network node (e.g., an eNodeB).</p>
<p>wherein the designating unit is configured to designate the long buffer status reporting format when there is sufficient uplink bandwidth to communicate using the long buffer status reporting format.</p>	<p>Each '820 Apple Accused Product includes a designating unit configured to designate the long buffer status reporting format when there is sufficient uplink bandwidth to communicate using the long buffer status reporting format. The designating unit of each Accused Product comprises hardware (e.g., a baseband processor) and/or software (e.g., baseband software and related drivers) configured to perform one or more of the algorithms set forth in the '820 patent at 6:1-42, 7:58-8:1, 8:17-39, 10:29-44, and Figures 2-4. Such hardware and software is capable of detecting available uplink bandwidth or capacity (e.g., the size of an uplink grant or transport block) and designating one of a plurality of BSR formats. As explained herein, the designating unit may ascertain an appropriate BSR format (e.g., short or long) in light of the available uplink bandwidth or capacity detected. For instance, the designating unit may determine whether there is sufficient uplink bandwidth or capacity to communicate a buffer status report using the long BSR format and, if so, designate the long BSR</p>

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	<p>format. However, if it detects there is not enough uplink bandwidth or capacity to use the long BSR format, it may designate a short BSR format. The designating unit may also take into account priority of buffered data. For example, if it detects there is not enough uplink bandwidth or capacity to use the long BSR format, it may designate a short BSR format for a buffer having a highest priority.</p> <p>For instance, as explained above for “Regular BSRs” and “Periodic BSRs,” if more than one LCG has data available for transmission and bandwidth is available, the Long BSR format is used. In such instances, the Long BSR has priority over other data, including user data. Further, as explained above in the case of “Padding BSR,” each '820 Apple Accused Product reports a Long BSR when (1) uplink resources are allocated for buffered data (i.e., the buffers contain data waiting to be transferred from the UE to the network), (2) the number of padding bits is equal to or larger than the size of the BSR MAC control element plus its sub-header, and (3) the number of padding bits is equal to or larger than the size of a Long BSR plus its sub-header.</p> <p>Thus, when there is sufficient uplink bandwidth available for a Long BSR (e.g., when there is enough space in the uplink resources allocated for buffered data), each '820 Apple Accused Product designates and communicates using the Long BSR format. Each '820 Apple Accused Product includes a designating unit (e.g., software) to implement this functionality.</p> <p>Alternatively, CCE contends that this claim element is met under the doctrine of equivalents because above-described features of the Accused Products perform substantially the same function recited in this element, in substantially the same way to achieve substantially the same result. Any alleged differences between the above-described features and the recited element are insubstantial and immaterial to infringement.</p>
17. The apparatus of claim 12, wherein the memory and the computer program	<p><i>See</i> analysis of claim 12, which is incorporated herein by reference.</p> <p>Each '820 Apple Accused Product includes the features and capabilities</p>

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code are further configured to, with the processor, cause the apparatus at least to designate the short buffer status reporting format when there is insufficient uplink bandwidth.	<p>described in claim 12. Further, as discussed above with the case of "Padding BSR," the Short or Truncated BSR format is used when there is insufficient uplink bandwidth to send a long buffer status report. The processor of each '820 Apple Accused Product is thus configured to designate the short buffer status reporting format when there is insufficient uplink bandwidth.</p> <p>5.4.5 Buffer Status Reporting</p> <p>The Buffer Status reporting procedure is used to provide the serving eNB with information about the amount of data available for transmission in the UL buffers of the UE. RRC controls BSR reporting by configuring the two timers <i>periodicBSR-Timer</i> and <i>retxBSR-Timer</i> and by, for each logical channel, optionally signalling <i>logicalChannelGroup</i> which allocates the logical channel to an LCG [8].</p> <p>For the Buffer Status reporting procedure, the UE shall consider all radio bearers which are not suspended and may consider radio bearers which are suspended.</p> <p>A Buffer Status Report (BSR) shall be triggered if any of the following events occur:</p> <ul style="list-style-type: none"> - UL data, for a logical channel which belongs to a LCG, becomes available for transmission in the RLC entity or in the PDCP entity (the definition of what data shall be considered as available for transmission is specified in [3] and [4] respectively) and either the data belongs to a logical channel with higher priority than the priorities of

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	<p>the logical channels which belong to any LCG and for which data is already available for transmission, or there is no data available for transmission for any of the logical channels which belong to a LCG, in which case the BSR is referred below to as "Regular BSR";</p> <ul style="list-style-type: none"> - UL resources are allocated and number of padding bits is equal to or larger than the size of the Buffer Status Report MAC control element plus its subheader, in which case the BSR is referred below to as "Padding BSR"; - <i>retxBSR-Timer</i> expires and the UE has data available for transmission for any of the logical channels which belong to a LCG, in which case the BSR is referred below to as "Regular BSR"; - <i>periodicBSR-Timer</i> expires, in which case the BSR is referred below to as "Periodic BSR". <p>For Regular and Periodic BSR:</p> <ul style="list-style-type: none"> - if more than one LCG has data available for transmission in the TTI where the BSR is transmitted: report Long BSR; - else report Short BSR. <p>For Padding BSR:</p> <ul style="list-style-type: none"> - if the number of padding bits is equal to or larger than the size of the Short BSR plus its subheader but smaller than the size of the Long BSR plus its subheader: <ul style="list-style-type: none"> - if more than one LCG has data available for transmission in the TTI where the BSR is transmitted: report Truncated BSR of the LCG with the highest priority logical channel with data available for transmission; - else report Short BSR. - else if the number of padding bits is equal to or larger than the size of the Long BSR plus its subheader, report Long BSR. <p>For instance, as explained above in the case of "Padding BSR," each '820 HTC Accused Product reports a Short or Truncated BSR when the number of padding bits is smaller than the size of a Long BSR but equal to or larger than a Short BSR.</p> <p>Alternatively, CCE contends that this claim element is met under the doctrine of equivalents because above-described features of the Accused Products perform substantially the same function recited in this element, in substantially the same way to achieve substantially the same result. Any alleged differences between the above-described features and the recited element are insubstantial and immaterial to infringement.</p>

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20. The apparatus of claim 12, wherein the long buffer status reporting format comprises four segments of 6-bits of information, each segment thereof corresponding to a distinct radio bearer group.	<p>See analysis of claim 12, which is incorporated herein by reference.</p> <p>As shown above, each '820 Apple Accused Product has and performs the features and capabilities described in claim 12. Further, the long buffer status reporting format of each '820 Apple Accused Product comprises four segments of 6-bits of information, each segment thereof corresponding to a distinct radio bearer group.</p> <p>As explained above, Long BSRs, Short BSRs, and Truncated BSRs of each '820 Apple Accused Product are formatted as set forth in TS 36.321:</p> <p>The fields LCG ID and Buffer Size are defined as follow:</p> <ul style="list-style-type: none">- LCG ID: The Logical Channel Group ID field identifies the group of logical channel(s) which buffer status is being reported. The length of the field is 2 bits;- Buffer Size: The Buffer Size field identifies the total amount of data available across all logical channels of a logical channel group after the MAC PDU has been built. The amount of data is indicated in number of bytes. It shall include all data that is available for transmission in the RLC layer and in the PDCP layer; the definition of what data shall be considered as available for transmission is specified in [3] and [4] respectively. The size of the RLC and MAC headers are not considered in the buffer size computation. The length of this field is 6 bits. The values taken by the Buffer Size field are shown in Table 6.1.3.1-1. <div><div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div></div><table><tr><td>LCG ID</td><td>Buffer Size</td><td>Oct 1</td></tr></table></div> <p>Figure 6.1.3.1-1: Short BSR and Truncated BSR MAC control element</p> <div><div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div></div><table><tr><td colspan="2">Buffer Size #0</td><td>Buffer Size #1</td><td>Oct 1</td></tr><tr><td>Buffer Size #1</td><td colspan="2">Buffer Size #2</td><td>Oct 2</td></tr><tr><td>Buffer Size #2</td><td colspan="2">Buffer Size #3</td><td>Oct 3</td></tr></table></div> <p>Figure 6.1.3.1-2: Long BSR MAC control element</p> <p>The Short BSR and Truncated BSR format of each '820 Apple Accused Product comprises 1 byte (i.e., 8 bits) of information with a 2-bit LCG identifier and a 6-bit buffer size, while the Long BSR format of each '820 Apple Accused Product comprises 3 bytes (i.e., 24 bits) of information with four segments, 6 bits long, each corresponding to a particular LCC. Accordingly, the Long BSR reports the</p>	LCG ID	Buffer Size	Oct 1	Buffer Size #0		Buffer Size #1	Oct 1	Buffer Size #1	Buffer Size #2		Oct 2	Buffer Size #2	Buffer Size #3		Oct 3
LCG ID	Buffer Size	Oct 1														
Buffer Size #0		Buffer Size #1	Oct 1													
Buffer Size #1	Buffer Size #2		Oct 2													
Buffer Size #2	Buffer Size #3		Oct 3													

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	<p>amount of data for four logical channel groups (LCGs) of each '820 Apple Accused Product, while the Short BSR and Truncated BSR reports the amount of data for one LCG. In the LTE (E-UTRA) network environment of each '820 Apple Accused Product, each radio bearer (or logical channel) is mapped to a LCG by a network node (e.g., eNodeB) based on the quality of service attributes of the radio bearers (e.g., QoS Class Identifier). Accordingly, the Short BSR and Truncated BSR format of each '820 Apple Accused Product corresponds to the buffer status of a single radio bearer group and the Long BSR format of each '820 Apple Accused Product corresponds to the buffer status of multiple radio bearer groups.</p>
<p>21. The apparatus of claim 12, wherein the memory and the computer program code are further configured to, with the processor, cause the apparatus at least to select a buffer status of a radio bearer group of a highest priority.</p>	<p><i>See</i> analysis of claim 12, which is incorporated herein by reference.</p> <p>As shown above, each '820 Apple Accused Product includes the features and capabilities described in claim 12. Further, for each '820 Apple Accused Product, in the case of "Padding BSR", when more than one LCG has data available for transmission in the interval where the BSR is transmitted, a Truncated BSR for the LCG with the highest priority logical channel with data available for transmission is selected for reporting. If only one LGC has data for transmission, that LGC has the highest priority and each '820 Apple Accused Product will report a Short BSR.</p> <p>5.4.5 Buffer Status Reporting</p> <p>The Buffer Status reporting procedure is used to provide the serving eNB with information about the amount of data available for transmission in the UL buffers of the UE. RRC controls BSR reporting by configuring the two timers <i>periodicBSR-Timer</i> and <i>retxBSR-Timer</i> and by, for each logical channel, optionally signalling <i>logicalChannelGroup</i> which allocates the logical channel to an LCG [8].</p> <p>For the Buffer Status reporting procedure, the UE shall consider all radio bearers which are not suspended and may consider radio bearers which are suspended.</p> <p>A Buffer Status Report (BSR) shall be triggered if any of the following events occur:</p> <ul style="list-style-type: none"> UL data, for a logical channel which belongs to a LCG, becomes available for transmission in the RLC entity or in the PDCP entity (the definition of what data shall be considered as available for transmission is specified in [3] and [4] respectively) and either the data belongs to a logical channel with higher priority than the priorities of

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	<p>the logical channels which belong to any LCG and for which data is already available for transmission, or there is no data available for transmission for any of the logical channels which belong to a LCG, in which case the BSR is referred below to as "Regular BSR";</p> <ul style="list-style-type: none"> - UL resources are allocated and number of padding bits is equal to or larger than the size of the Buffer Status Report MAC control element plus its subheader, in which case the BSR is referred below to as "Padding BSR"; - <i>retxBSR-Timer</i> expires and the UE has data available for transmission for any of the logical channels which belong to a LCG, in which case the BSR is referred below to as "Regular BSR"; - <i>periodicBSR-Timer</i> expires, in which case the BSR is referred below to as "Periodic BSR". <p>For Regular and Periodic BSR:</p> <ul style="list-style-type: none"> - if more than one LCG has data available for transmission in the TTI where the BSR is transmitted: report Long BSR; - else report Short BSR. <p>For Padding BSR:</p> <ul style="list-style-type: none"> - if the number of padding bits is equal to or larger than the size of the Short BSR plus its subheader but smaller than the size of the Long BSR plus its subheader: <ul style="list-style-type: none"> - if more than one LCG has data available for transmission in the TTI where the BSR is transmitted: report Truncated BSR of the LCG with the highest priority logical channel with data available for transmission; - else report Short BSR. - else if the number of padding bits is equal to or larger than the size of the Long BSR plus its subheader, report Long BSR. <p>Alternatively, CCE contends that this claim element is met under the doctrine of equivalents because above-described features of the Accused Products perform substantially the same function recited in this element, in substantially the same way to achieve substantially the same result. Any alleged differences between the above-described features and the recited element are insubstantial and immaterial to infringement.</p>
22. The apparatus of claim 21, wherein the radio bearer group of the highest priority comprises a radio bearer group having a most amount of data in a radio	<p>See analysis of claim 21, which is incorporated herein by reference.</p> <p>As shown above, each '820 Apple Accused Product includes and performs the features and capabilities described in claim 10. For each '820 Apple Accused Product, in the case of "Padding BSR", when more than one LCG has data</p>

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bearer group buffer.	<p>available for transmission in the interval where the BSR is transmitted, a Truncated BSR for the LCG with the highest priority logical channel with data available for transmission is selected for reporting. The highest priority logical channel has or may have the most amount of data in its corresponding buffer. If only one LGC has data for transmission, that LGC has the most data and the highest priority, and each '820 Apple Accused Product will report a Short BSR.</p> <p>5.4.5 Buffer Status Reporting</p> <p>The Buffer Status reporting procedure is used to provide the serving eNB with information about the amount of data available for transmission in the UL buffers of the UE. RRC controls BSR reporting by configuring the two timers <i>periodicBSR-Timer</i> and <i>retxBSR-Timer</i> and by, for each logical channel, optionally signalling <i>logicalChannelGroup</i> which allocates the logical channel to an LCG [8].</p> <p>For the Buffer Status reporting procedure, the UE shall consider all radio bearers which are not suspended and may consider radio bearers which are suspended.</p> <p>A Buffer Status Report (BSR) shall be triggered if any of the following events occur:</p> <ul style="list-style-type: none"> - UL data, for a logical channel which belongs to a LCG, becomes available for transmission in the RLC entity or in the PDCP entity (the definition of what data shall be considered as available for transmission is specified in [3] and [4] respectively) and either the data belongs to a logical channel with higher priority than the priorities of

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	<p>the logical channels which belong to any LCG and for which data is already available for transmission, or there is no data available for transmission for any of the logical channels which belong to a LCG, in which case the BSR is referred below to as "Regular BSR";</p> <ul style="list-style-type: none"> - UL resources are allocated and number of padding bits is equal to or larger than the size of the Buffer Status Report MAC control element plus its subheader, in which case the BSR is referred below to as "Padding BSR"; - <i>retxBSR-Timer</i> expires and the UE has data available for transmission for any of the logical channels which belong to a LCG, in which case the BSR is referred below to as "Regular BSR"; - <i>periodicBSR-Timer</i> expires, in which case the BSR is referred below to as "Periodic BSR". <p>For Regular and Periodic BSR:</p> <ul style="list-style-type: none"> - if more than one LCG has data available for transmission in the TTI where the BSR is transmitted: report Long BSR; - else report Short BSR. <p>For Padding BSR:</p> <ul style="list-style-type: none"> - if the number of padding bits is equal to or larger than the size of the Short BSR plus its subheader but smaller than the size of the Long BSR plus its subheader: <ul style="list-style-type: none"> - if more than one LCG has data available for transmission in the TTI where the BSR is transmitted: report Truncated BSR of the LCG with the highest priority logical channel with data available for transmission; - else report Short BSR. - else if the number of padding bits is equal to or larger than the size of the Long BSR plus its subheader, report Long BSR.
<p>24. A non-transitory computer-readable medium encoded with a computer program configured to control a processor to perform operations comprising:</p>	<p>Apple, AT&T, Verizon, Sprint, and T-Mobile infringe the '820 patent either directly and/or indirectly. Each Defendant makes, uses, sells, offers to sell, and/or imports '820 Apple Accused Products, each of which is a cellular device that includes and performs the features and capabilities described in this claim.</p> <p>Plaintiff contends that each Defendant directly infringes this claim because it makes, uses, sells, offers to sell, and/or imports the '820 Apple Accused Products, each of which includes and/or practices each and every element of this claim. Additionally, each Defendant indirectly infringes this claim by (1) inducing, with knowledge of the patent (at least by virtue of its disclosure to ETSI), its customers' use of the '820 Apple Accused Products to practice each</p>

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	<p>and every one of the following claim elements with knowledge that such practice infringes this claim and intent to cause such infringement (as evidenced for example in user guides and other instructional materials provided by each Defendant such as instructions to operate the Accused Product within a provided service area), and/or (2) contributing to direct infringement by customers that use the '820 Apple Accused Products to practice each and every one of the following claim elements, with knowledge that infringing features of the '820 Apple Accused Products have no substantial non-infringing uses (by their nature as proprietary hardware components and software instructions that work in concert to perform specific, intended functions) and the combination for which such features was made infringes this claim.</p> <p>Each '820 Apple Accused Product is a subscriber station that includes software stored in non-transitory memory configured to control a processor to perform the steps and elements as set forth in this claim. Specifically, each '820 Apple Accused Product is a cellular device that includes hardware and software (including memory, one or more processors, radios, firmware, and drivers) configured to support and provide wireless communications in an LTE (E-UTRA) environment. As such, each '820 Apple Accused Product is compliant with and supports technical specifications published by 3GPP and ETSI for LTE (E-UTRA) technology, including TS 36.321, Release 8 and subsequent versions. Indeed, the '820 patent is essential to compliance with LTE (E-UTRA) standards.</p> <p>In the LTE (E-UTRA) network environment, a subscriber station (or user equipment, "UE"), such as each '820 Apple Accused Product), is configured to perform a buffer status reporting procedure as set forth in TS 36.321. Buffer Status Reports (BSRs) from UE to network nodes are used to assist network allocation of uplink radio resources. In an LTE (E-UTRA) network environment, radio resources are only allocated for transmission to or from a UE if data is available to be sent or received. In the downlink direction, the network node scheduler is aware of the amount of data to be delivered to a UE. In the uplink direction, however, scheduling decisions are performed by a network node (e.g.,</p>

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	<p>an eNodeB) and the buffer for the data is located in the UE. Accordingly, BSRs must be sent by the UE to the network node to indicate the amount of data in the UE that needs to be transmitted over the uplink. <i>See</i> Stefania Sesia, et al., "LTE: The UMTS Long Term Evolution: From Theory to Practice," John Wiley & Sons, 2009.</p> <p>Accordingly, each '820 Apple Accused Product performs a BSR reporting procedure, set forth in TS 36.321, to provide serving network nodes with information about the amount of data available for transmission in its uplink buffers. More specifically, a BSR is triggered in each '820 Apple Accused Product if any of certain pre-selected conditions corresponding to the buffers occur, as set forth in TS 36.321. Depending on the condition detected, each '820 Apple Accused Product designates a BSR reporting format (e.g., long BSR, truncated BSR, short BSR):</p> <p>5.4.5 Buffer Status Reporting</p> <p>The Buffer Status reporting procedure is used to provide the serving eNB with information about the amount of data available for transmission in the UL buffers of the UE. RRC controls BSR reporting by configuring the two timers <i>periodicBSR-Timer</i> and <i>retxBSR-Timer</i> and by, for each logical channel, optionally signalling <i>logicalChannelGroup</i> which allocates the logical channel to an LCG [8].</p> <p>For the Buffer Status reporting procedure, the UE shall consider all radio bearers which are not suspended and may consider radio bearers which are suspended.</p> <p>A Buffer Status Report (BSR) shall be triggered if any of the following events occur:</p> <ul style="list-style-type: none"> - UL data, for a logical channel which belongs to a LCG, becomes available for transmission in the RLC entity or in the PDCP entity (the definition of what data shall be considered as available for transmission is specified in [3] and [4] respectively) and either the data belongs to a logical channel with higher priority than the priorities of

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	<p>the logical channels which belong to any LCG and for which data is already available for transmission, or there is no data available for transmission for any of the logical channels which belong to a LCG, in which case the BSR is referred below to as "Regular BSR";</p> <ul style="list-style-type: none"> - UL resources are allocated and number of padding bits is equal to or larger than the size of the Buffer Status Report MAC control element plus its subheader, in which case the BSR is referred below to as "Padding BSR"; - <i>retxBSR-Timer</i> expires and the UE has data available for transmission for any of the logical channels which belong to a LCG, in which case the BSR is referred below to as "Regular BSR"; - <i>periodicBSR-Timer</i> expires, in which case the BSR is referred below to as "Periodic BSR". <p>For Regular and Periodic BSR:</p> <ul style="list-style-type: none"> - if more than one LCG has data available for transmission in the TTI where the BSR is transmitted: report Long BSR; - else report Short BSR. <p>For Padding BSR:</p> <ul style="list-style-type: none"> - if the number of padding bits is equal to or larger than the size of the Short BSR plus its subheader but smaller than the size of the Long BSR plus its subheader: <ul style="list-style-type: none"> - if more than one LCG has data available for transmission in the TTI where the BSR is transmitted: report Truncated BSR of the LCG with the highest priority logical channel with data available for transmission; - else report Short BSR. - else if the number of padding bits is equal to or larger than the size of the Long BSR plus its subheader, report Long BSR. <p>Long BSRs, Short BSRs, and Truncated BSRs are formatted as set forth in TS 36.321:</p>

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	<p>The fields LCG ID and Buffer Size are defined as follow:</p> <ul style="list-style-type: none"> - LCG ID: The Logical Channel Group ID field identifies the group of logical channel(s) which buffer status is being reported. The length of the field is 2 bits; - Buffer Size: The Buffer Size field identifies the total amount of data available across all logical channels of a logical channel group after the MAC PDU has been built. The amount of data is indicated in number of bytes. It shall include all data that is available for transmission in the RLC layer and in the PDCP layer; the definition of what data shall be considered as available for transmission is specified in [3] and [4] respectively. The size of the RLC and MAC headers are not considered in the buffer size computation. The length of this field is 6 bits. The values taken by the Buffer Size field are shown in Table 6.1.3.1-1. <div data-bbox="1087 557 1451 626" data-label="Diagram"> <pre> +-----+ LCG ID Buffer Size +-----+ Oct 1 </pre> </div> <p>Figure 6.1.3.1-1: Short BSR and Truncated BSR MAC control element</p> <div data-bbox="1087 704 1451 850" data-label="Diagram"> <pre> +-----+ Buffer Size #0 Buffer Size #1 +-----+ Buffer Size #1 Buffer Size #2 +-----+ Buffer Size #2 Buffer Size #3 +-----+ Oct 3 </pre> </div> <p>Figure 6.1.3.1-2: Long BSR MAC control element</p> <p>As shown above, the Short BSR and Truncated BSR format comprises 1 byte of information with a 2-bit LCG identifier and a 6-bit buffer size, while the Long BSR format comprises 3 bytes of information with four segments, 6 bits long, each corresponding to a particular LCG. Accordingly, the Long BSR reports the amount of data for four logical channel groups (LCGs), while the Short BSR and Truncated BSR reports the amount of data for one LCG. In the LTE (E-UTRA) network environment, each radio bearer (or logical channel) is mapped to a LCG by a network node (e.g., eNodeB) based on the quality of service attributes of the radio bearers (e.g., QoS Class Identifier). Accordingly, the Short BSR and Truncated BSR format corresponds to the buffer status of a single radio bearer group and the Long BSR format corresponds to the buffer status of multiple radio bearer groups.</p> <p>As shown above, TS 36.321 sets forth conditions under which a “Regular BSR”</p>

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	<p>or “Periodic BSR” is triggered. For “Regular BSRs” and “Periodic BSRs,” if more than one LCG has data available for transmission and bandwidth is available, the Long BSR format is used. Accordingly, each '820 Apple Accused Product designates the Long BSR format when multiple buffers for different radio bearer groups store data beyond a preselected threshold (e.g., when uplink data becomes available for transmission in different bearer groups and/or buffers).</p> <p>As further shown above, in the case of “Padding BSR,” each '820 Apple Accused Product reports a Long BSR when (1) uplink resources are allocated for buffered data (i.e., the buffers contain data waiting to be transferred from the UE to the network), (2) the number of padding bits is equal to or larger than the size of the BSR MAC control element plus its sub-header, and (3) the number of padding bits is equal to or larger than the size of a Long BSR plus its sub-header. Thus, when there is sufficient uplink bandwidth available for a Long BSR, each '820 Apple Accused Product designates and communicates using the Long BSR format.</p> <p>Continuing with the case of “Padding BSR,” each '820 Apple Accused Product reports a Short or Truncated BSR when the number of padding bits is smaller than the size of a Long BSR but equal to or larger than a Short BSR. In such circumstances, if more than once LCG has data for transmission, each '820 Apple Accused Product will report a Truncated BSR of the LCG with the highest priority logical channel with data available for transmission. If only one LGC has data for transmission, each '820 Apple Accused Product will report a Short BSR.</p>
monitoring a usage of a plurality of buffers;	Each '820 Apple Accused Product monitors a usage of a plurality of buffers. As explained above, each '820 Apple Accused Product provides BSRs based on the buffer status of one or more LCGs.
detecting one of a plurality of pre-selected conditions corresponding to the plurality	Each '820 Apple Accused Product detects one of a plurality of pre-selected conditions corresponding to the plurality of buffers. As explained above, the

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of buffers;	<p>pre-selected conditions corresponding to buffers (e.g., presence of data in one or multiple buffers) that may be detected by each '820 Apple Accused Product are set forth in TS 36.321:</p> <p>5.4.5 Buffer Status Reporting</p> <p>The Buffer Status reporting procedure is used to provide the serving eNB with information about the amount of data available for transmission in the UL buffers of the UE. RRC controls BSR reporting by configuring the two timers <i>periodicBSR-Timer</i> and <i>retxBSR-Timer</i> and by, for each logical channel, optionally signalling <i>logicalChannelGroup</i> which allocates the logical channel to an LCG [8].</p> <p>For the Buffer Status reporting procedure, the UE shall consider all radio bearers which are not suspended and may consider radio bearers which are suspended.</p> <p>A Buffer Status Report (BSR) shall be triggered if any of the following events occur:</p> <ul style="list-style-type: none"> - UL data, for a logical channel which belongs to a LCG, becomes available for transmission in the RLC entity or in the PDCP entity (the definition of what data shall be considered as available for transmission is specified in [3] and [4] respectively) and either the data belongs to a logical channel with higher priority than the priorities of

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	<p>the logical channels which belong to any LCG and for which data is already available for transmission, or there is no data available for transmission for any of the logical channels which belong to a LCG, in which case the BSR is referred below to as "Regular BSR";</p> <ul style="list-style-type: none"> - UL resources are allocated and number of padding bits is equal to or larger than the size of the Buffer Status Report MAC control element plus its subheader, in which case the BSR is referred below to as "Padding BSR"; - <i>retxBSR-Timer</i> expires and the UE has data available for transmission for any of the logical channels which belong to a LCG, in which case the BSR is referred below to as "Regular BSR"; - <i>periodicBSR-Timer</i> expires, in which case the BSR is referred below to as "Periodic BSR". <p>For Regular and Periodic BSR:</p> <ul style="list-style-type: none"> - if more than one LCG has data available for transmission in the TTI where the BSR is transmitted: report Long BSR; - else report Short BSR. <p>For Padding BSR:</p> <ul style="list-style-type: none"> - if the number of padding bits is equal to or larger than the size of the Short BSR plus its subheader but smaller than the size of the Long BSR plus its subheader: <ul style="list-style-type: none"> - if more than one LCG has data available for transmission in the TTI where the BSR is transmitted: report Truncated BSR of the LCG with the highest priority logical channel with data available for transmission; - else report Short BSR. - else if the number of padding bits is equal to or larger than the size of the Long BSR plus its subheader, report Long BSR.
designating one of a plurality of buffer status reporting formats comprising a long buffer status reporting format and a short buffer status reporting format depending on the pre-selected condition detected; and	<p>Each '820 Apple Accused Product designates one of a plurality of buffer status reporting formats comprising a long buffer status reporting format and a short buffer status reporting format depending on the pre-selected condition detected.</p> <p>As explained above, each '820 Apple Accused Product designates a Long BSR, Truncated BSR, or Short BSR depending on detected conditions.</p> <p>In the case of "Regular BSRs" and "Periodic BSRs," if more than one LCG has data available for transmission and bandwidth is available, the Long BSR format is used. Accordingly, each '820 Apple Accused Product designates the Long BSR format when multiple buffers for different radio bearer groups store data beyond a preselected threshold (e.g., when uplink data becomes available for</p>

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	<p>transmission in different bearer groups and/or buffers).</p> <p>In the case of "Padding BSR," each '820 Apple Accused Product reports a Long BSR when (1) uplink resources are allocated for buffered data (i.e., the buffers contain data waiting to be transferred from the UE to the network), (2) the number of padding bits is equal to or larger than the size of the BSR MAC control element plus its sub-header, and (3) the number of padding bits is equal to or larger than the size of a Long BSR plus its sub-header. Each '820 Apple Accused Product reports a Short or Truncated BSR when the number of padding bits is smaller than the size of a Long BSR but equal to or larger than a Short BSR.</p>
communicating a buffer status report to a network device in accordance with the buffer status reporting format designated,	<p>Each '820 Apple Accused Product communicates a buffer status report to a network device in accordance with the buffer status reporting format designated. As explained above, each '820 Apple Accused Product transmits a BSR (e.g., a Long BSR, Truncated BSR, or Short BSR) to a LTE (E-UTRA) network node (e.g., an eNodeB).</p>
wherein the designating designates the long buffer status reporting format when there is sufficient uplink bandwidth to communicate using the long buffer status reporting format.	<p>Each '820 Apple Accused Product designates the long buffer status reporting format when there is sufficient uplink bandwidth to communicate using the long buffer status reporting format.</p> <p>For instance, as explained above for "Regular BSRs" and "Periodic BSRs," if more than one LCG has data available for transmission and bandwidth is available, the Long BSR format is used. In such instances, the Long BSR has priority over other data, including user data. Further, as explained above in the case of "Padding BSR," each '820 Apple Accused Product reports a Long BSR when (1) uplink resources are allocated for buffered data (i.e., the buffers contain data waiting to be transferred from the UE to the network), (2) the number of padding bits is equal to or larger than the size of the BSR MAC control element plus its sub-header, and (3) the number of padding bits is equal to or larger than the size of a Long BSR plus its sub-header.</p>

Cellular Communication Technologies LLC v. Apple Inc., et al.**EXHIBIT E TO PLAINTIFF'S SECOND SUPPLEMENTAL INFRINGEMENT CONTENTIONS**

U.S. Pat. No. 8,055,820	'820 APPLE ACCUSED PRODUCTS ¹
	<p>Thus, when there is sufficient uplink bandwidth available for a Long BSR (e.g., when there is enough space in the uplink resources allocated for buffered data), each '820 Apple Accused Product designates and communicates using the Long BSR format.</p> <p>Alternatively, CCE contends that this claim element is met under the doctrine of equivalents because above-described features of the Accused Products perform substantially the same function recited in this element, in substantially the same way to achieve substantially the same result. Any alleged differences between the above-described features and the recited element are insubstantial and immaterial to infringement.</p>